HEAD JOINT DRAINAGE DEVICE, WALL SYSTEM AND METHOD FOR DRAINING MOISTURE FROM A HEAD JOINT

Technical Field

[0001] This invention relates to moisture drainage products and, more particularly, to moisture drainage products intended for incorporation in wall systems and methods for providing moisture drainage in wall systems.

Background

[0002] Warm, moisture-laden air can exist in buildings including buildings in colder climates. A significant amount of moisture can be placed into the air through common household activities, such as cooking, bathing and showering.

[0003] Especially in colder climates, insulation in a wall structure helps to reduce heat loss from buildings which are heated due to the cold climate. As moisture-laden air passes through the wall structure of such buildings, the moisture-laden air encounters steadily decreasing temperatures. As the air is cooled while moving from the interior of a wall structure to the exterior of the wall structure, the air can eventually reach its dew point and water vapor in the air condenses to form moisture. The result can be a moisture buildup in the wall structure.

[0004] Vapor barriers are commonly employed on the warm side of wall structures in order to prevent moisture-laden air from entering the wall structure. However, vapor barriers are not usually perfect. In a typical building, multiple penetrations of a vapor barrier can occur, e.g., from electrical and plumbing lines and from window and door openings.

[0005] If the exterior temperature is cold enough, moisture existing in the wall structure could eventually turn to frost or ice and, thus, be prevented from draining from the wall structure, at least until the exterior temperature increases. When that happens, however, the moisture can still cause significant damage to the wall structure.

[0006] Various products have been created to allow drainage of moisture from wall structures once the moisture has formed in the wall structure.

[0007] U.S. Patent No. 3,654,765, Healy et al, Subterranean Wall Drain, discloses a subterranean wall drain unit including a drain pipe having openings therein and a

longitudinally extending planar core defining channels normal to the pipe. A water pervious sheet material covers one face of the core and the openings in the pipe to form a filter therefore. The other face of the core may be covered with a plastic sheet or other vapor barrier.

[0008] U.S. Patent No. 3,888,087, Bergsland, Foundation Wall Protective Sheet, discloses improvements in protective membranes or sheets for foundation walls. The sheets have regular courses of protrusions for spacing the sheet from the foundation wall and a porous backing for drainage outwardly of the sheet. The protrusions provide air channels between the protective sheet and the foundation for thermal insulation and for facilitating drying of the foundation wall. Small vertical ribs between the courses of the protrusions provide convenient water passages to take care of drainage water in the porous backing without interfering with the air spaces and incidentally providing bending vertical lines for more facile installation handling. Modifications of the sheet include transverse ribs at lower portions of the sheet to allow horizontal bending thereof wall for footing and drainage configurations. A barrier for preventing back fill falling between the protective sheathing and foundation is also disclosed.

[0009] U.S. Patent No. 3,318,056, Thompson, Ventilating Wall Construction With Stud Location Indicators, discloses a sheet of building material placed between wall veneers for moisture protection that includes vertical drainage channels and perforations.

[0010] U.S. Patent No. 6,298,620, Hatzinilolas, Moisture Control Panel, discloses a moisture control panel used in exterior walls. A wall constructed with the panel has an inner back-up wall component and an outer wall component of a moisture pervious material, for example, stucco. The moisture control panel is positioned between the two. It has a base sheet on the inner face of the outer wall component. A set of drying perforations slope downwardly toward the inside through this sheet. This drains moisture from the inside of the outer wall component. On the inside, the base sheet has a set of upwardly sloping bosses which provide an air space on the inside the moisture control panel providing for air circulation and drainage of any moisture.

[0011] U.S. Patent No. 4,381,630, Koester, Foundation Vent Structure, discloses a foundation vent structure positioned upon the footings of the building below the lowermost row of concrete blocks of the basement wall and extends below the concrete floor of the

basement. The vent structure is formed of a plastic material, preferably in strips, and is shaped to define alternate tunnels and channels having openings therein. The vent structure intercommunicates the openings in the hollow, concrete blocks with the drain area located along the marginal area below the basement wall to permit moisture to be vented into this drain area.

[0012] However, these products encounter a problem when the wall structure is interrupted by a horizontal structural member such as a wall opening, e.g., a window or door opening, or a shelf angle typically placed at building floor levels or upon a certain vertical distance. Such interruptions disrupt the otherwise downward flow of moisture to the bottom of the wall structure and may interfere with the proper operation of some of the above solutions. Such products are not typically designed to operate effectively at a head joint where the wall structure is interrupted by a wall opening or shelf angle.

Summary Of The Invention

[0013] This problem is exacerbated when the exterior veneer of the wall structure is formed with modular building products, such as brick. Mortar is typically used to form a mortar joint between otherwise adjacent bricks and between layers of bricks. Such mortar can interfere with the proper flow of moisture wall through the wall cavity and, ultimately, outside of the wall cavity. When mortar is used to set bricks, for example, on a steel lintel or shelf angle, the mortar can effectively hinder the passage of moisture from the wall cavity to the exterior of the wall structure. Such horizontal interruption is collectively referred to herein as a horizontal interruption.

[0014] The present invention is a wall structure, method and a head joint drainage device which allows a channel for moisture which otherwise might collect in a wall structure where a head joint encounters a horizontal interruption to properly escape to the exterior of the wall structure.

[0015] In one embodiment, the present invention provides a head joint drainage device adapted to allow drainage of moisture from a head joint meeting a horizontal interruption of a structure formed with a plurality of building products set with mortar forming a mortar joint between adjacent ones of the plurality of modular building products. A spacer has a top portion, having a length approximately equal to a depth of the plurality of building products

and a width approximately equal to a width of the mortar joint, adapted to block the mortar from reaching the horizontal interruption and has a side portion adapted to keep the portion a distance away from the horizontal interruption, the distance allowing moisture drainage from the head joint.

[0016] In another embodiment, the present invention provides a wall system for a structure having a head joint meeting a horizontal interruption in a wall of a structure, the wall having a veneer. An angle is positioned at the head joint. A plurality of modular building products are set on the angle forming the veneer. Mortar is set between the adjacent ones of the plurality of modular building products forming a head joint of mortar. A spacer is positioned on the angle between the adjacent ones of the plurality of modular building products, the spacer forming a moisture drainage channel between the adjacent ones of the plurality of modular building products between the mortar and the angle.

[0017] In another embodiment, the present invention provides a method of providing drainage of moisture from a head joint meeting a horizontal interruption of a wall of a structure, the wall having a veneer constructed from a plurality of modular building products set with mortar forming a mortar joint between adjacent ones of the plurality of modular building products. One of the plurality of modular building products is placed on an angle at the horizontal interruption. A spacer is set on the angle adjacent the one of the plurality of modular building products. The mortar is applied to the one of the plurality of modular building products forming the mortar joint. Another of the plurality of modular building products is placed on the angle adjacent to the spacer.

[0018] In a preferred embodiment, the plurality of modular building products comprise a plurality of bricks.

[0019] In a preferred embodiment, the spacer has a top portion, having a length approximately equal to a depth of the plurality of building products and a width approximately equal to a width of the mortar head joint, adapted to block the mortar from reaching the angle and has a side portion adapted to keep the portion a distance away from the angle, the distance allowing moisture drainage from the head joint.

[0020] In a preferred embodiment, the top portion of the spacer is solid.

[0021] In a preferred embodiment, the side portion of the spacer is angled back from a front edge of the spacer.

[0022] In a preferred embodiment, the spacer further comprises a second one of the side portion.

[0023] In a preferred embodiment, the side portion of the spacer and the second one of the spacer each have approximately equal heights.

[0024] In a preferred embodiment, the spacer is formed into a plurality of sections, each of the plurality of sections having a length selected so that a length of an integral number of the plurality of sections is approximately equal to the depth of the plurality of modular building materials.

[0025] In a preferred embodiment, the top portion of the spacer has a transverse groove providing an ability for the plurality of sections to snap apart by hand.

[0026] In a preferred embodiment, the side portion of the spacer angles back from the top portion the transverse groove.

[0027] In a preferred embodiment, the side portion of the spacer roughly forms a v-shape.

[0028] In a preferred embodiment, the spacer is of a color which approximates a color of the mortar.

Brief Description Of The Drawings

[0029] **Figure 1** is a front elevation of wall system utilizing an embodiment of the present invention;

[0030] **Figure 2** is a perspective view of a partially constructed wall system in accordance with an embodiment of the present invention;

[0031] **Figure 3** is a close-up perspective view of a spacer in accordance with an embodiment of the present invention;

[0032] **Figure 4** is another view perspective view of the spacer of Figure 3;

[0033] **Figure 5** is a front view of a detail of a wall system in accordance with an embodiment of the present invention;

[0034] **Figure 6** is a front view of a wall system incorporating the head joint drainage device of the present invention;

[0035] **Figure 7** is a perspective view a strip of spacer elements;

[0036] **Figure 8** illustrates a head joint of a wall system in preparation for the installation of the present invention;

[0037] **Figure 9** illustrates the removal of one or spacer elements from a strip of spacer elements;

[0038] **Figure 10** illustrates the placement of a spacer at the head joint of a wall system;

[0039] **Figure 11** is a side view of a spacer placed next to a modular building product at the head joint of a wall system;

[0040] **Figure 12** is a front view of two spacers installed between two modular building products;

[0041] **Figure 13** illustrates the spreading of a bed of mortar over a row of modular building products;

[0042] **Figure 14** illustrates tuck pointing of mortar between modular building products; and

[0043] **Figure 15** illustrates of a front view of an installed head joint drainage device and wall system using a head joint drainage device showing the weep holes created.

Detailed Description

[0044] A head joint is formed in a wall structure when the wall structure has an opening in what would otherwise be an unbroken expanse of wall. Openings are commonly made in wall structures for windows and doors, for example. The wall structure essentially stops at the top of the window or door opening and, in the case of a window opening, may start again below the opening. The wall structure above the opening is typically supported by a structural header, designed to carry the load of the wall structure above the opening and spread the weight of that load the load bearing capacity of the wall structure on either side of the opening.

[0045] In the case of a wall structure having an a brick exterior, typically an exterior veneer of brick set in mortar, the weight of the wall structure above an opening is also distributed by a structural member to either side of the opening. With a brick wall structure, the load bearing member is typically called a lintel. A lintel is commonly constructed of a piece of steel, or other material capable of transferring weight. The lintel allows the weight of bricks placed on the lintel to be transferred to other structural wall members on either side

of the opening. Typically, a lintel is fashioned from an "L-shaped" steel member, or angle iron, which is fastened to structural wall elements either behind the lintel or below the lintel but on either side of the opening.

[0046] Further, a wall structure may have a shelf angle installed periodically or as needed at certain points or a certain vertical distances. Typically, a shelf angle can be installed at every building floor or perhaps for every sixteen (16) feet of vertical rise. A shelf angle performs a similar function as a lintel performs above an opening in the wall structure. A shelf angle is secured to a structural member and then bears the load of bricks, or other modular building components, placed above the shelf angle. A shelf angle can be fashioned from the same or similar members as a lintel as described above. A "head joint" is also formed between adjacent building components at the top of each shelf angle.

[0047] Either a lintel or a shelf angle creates a horizontal interruption in the otherwise uninterrupted wall structure of the exterior veneer. For purposes of this application, the term "angle" is used to describe both the lintel, as typically used above openings in wall structures, such as windows and doors, and the shelf angle, as typically used in periodic vertical increments in otherwise uninterrupted wall structures. References hereinafter referring to a lintel apply equally well to a shelf angle. For purposes of this application, discussion related to draining of moisture, or related activity, from head joints refers to both head joints occurring at lintels and to similar joints occurring at shelf angles.

[0048] **Figure 1** is a front elevation view of a building 2 having wall system 10 constructed in accordance with an embodiment of the present invention. Building 2 has a door opening 4 and four window openings 22. At the top edge of door opening 4 and each window opening 22, lintel 24 provides structural support for bricks 20. Lintels 24 are used at horizontal interruptions in wall system 10 created by door opening 4 and window openings 22. Additionally, shelf angles 6 are placed in periodic vertical distances on wall system 10. Shelf angles 6 also provide structural support for bricks 20.

[0049] **Figure 2** illustrates a partially constructed brick veneer wall system 10 utilizing an embodiment of the present invention. Wall system 10 is constructed from a structural wall 12, in this case using commonly available concrete blocks 14. Structural wall 12 may be reinforced with reinforcing rods 16. An exterior veneer wall 18 is constructed on the

exterior side of structural wall 12. Veneer wall 18 is constructed conventionally from modular building products, such as bricks 20.

[0050] Window opening 22 is formed into wall system 10. Lintel 24 is placed at the top edge of window opening 22 and secured to structural wall 12. Drip plate 26 can be placed directly on top of lintel 24 as an aid in preventing moisture from draining back along the underside of lintel 24 into wall structure 10. "Z-shaped" flashing 28 is then placed above lintel 24 and drip plate 26 to direct moisture which may exist in wall structure 10 to the exterior of wall structure 10 to prevent that moisture from entering window opening 22. Veneer wall 18 can then continue to be constructed above window opening 22 with lintel 24 supporting the weight of bricks 20.

[0051] As bricks 20 are laid in the construction of veneer wall 18, mortar 30 is placed between adjacent bricks 20, both vertically and horizontally. While flashing 28 is designed to direct moisture which may exist in wall structure of above window opening 22 to the exterior, it has been found that mortar 30 may inhibit that function. Mortar 30 may mostly or completely fill the space between bricks 20 and leave little of no room for moisture otherwise directed by flashing 28 to escape to the exterior of wall system 10.

[0052] Spacer 32 is placed between horizontally adjacent bricks 20 on top of flashing 28 to provide prevent mortar 30 from completely filling the space between adjacent bricks 20 and creating a channel allowing moisture from wall system 10 to be properly directed to the exterior by flashing 28.

[0053] Spacer 32 is more clearly illustrated in **Figure 3** and **Figure 4**. In a preferred embodiment, spacer 32 has a solid top surface 34 intended to substantially block mortar 30 from occupying the space created below top surface 34. Top surface 34 is approximately 3/8 inch (0.95 centimeters) wide. Side edges 36 provide support for top surface 34 to be spaced away from flashing 28 and provide space for drainage. Sides edges 36 have a height of approximately 3/8 inch (0.95 centimeters) high. Top surface 34 has a front edge 38 intended to flush with, or nearly flush with, the front edge of mortar 30 between bricks 20. The length of spacer 32 preferably is approximately to the depth of mortar 30 placed between adjacent bricks 20. The width of top surface 34 of spacer 32 is approximately equal to the width of mortar 30 forming a mortar joint between adjacent bricks 20. Spacer 32 will preferably fill the width of the mortar 30 joint between tow adjacent bricks 20. The height of side walls 36

of spacer 32 is enough to allow moisture to drain through a channel formed by the underside of top surface 34 and the interior of side edges 36. Preferably, the height of side walls 36 is approximately equal to the width of top surface 34.

[0054] **Figure 5** is a close-up frontal view of spacer 32 installed as a head joint weep in wall system 10 above window opening 22. Bricks 20 are set side by side on lintel 24 with mortar 30 forming a mortar joint between bricks 20. Mortar 30 also forms a mortar joint between side by side bricks 20 and brick 20 set above the side by side bricks. Spacer 32 is installed between bricks 20 with the bottom of side edges 36 resting on flashing 38 just above lintel 24. Mortar 30 is preventing from filling the entire joint between bricks 20 by top surface 34 of spacer 32 creating a weep hole 40 below top surface 34 and between side edges 36.

[0055] Wall system 10 seen from the front in **Figure 5** shows that front edge 38 of top surface 34 of spacer 32 is visible. The visibility of spacer 32 can be diminished by matching the color of front edge 38 of spacer 32 with the color of mortar 30. Spacer 30 then blends in with mortar 30 and, hence, is less visible.

[0056] Side edges 36 are angled, or tapered, away from front edge 38 of top surface 34. Such tapering or angling provides several advantageous benefits. One benefit is that side edges 36 are not as visible a front exterior view of wall system helping to diminish the visibility of spacer 32. Further, tapering or angling of side edges 36 at the rear of spacer 32 helps to ensure that any moisture located toward the rear of veneer wall 18 above flashing 28 enter weep hole 40 and be transported to the exterior of wall system 10. In a preferred embodiment, side edges 36 of spacer 32 are angled back from top surface 34 at both ends of spacer 32 allowing spacer 32 to be installed in either front to back orientation.

[0057] **Figure 6** shows a complete window opening 22 in wall system 10. Spacers 32 are shown installed at five locations along header joint formed by lintel 24. A spacer 32 is installed between bricks 20c and 20d, between bricks 20d and 20a, between bricks 20a and 20b, between bricks 20b and 20c and between bricks 20c and 20f.

[0058] Alternatively, it may not be necessary to install a spacer 32 between every one of bricks 20 along lintel 24. It is desired to install enough spacers 32 so that adequate drainage is allowed through weep holes 40 to drain moisture from wall system 10. For example, it is possible not to install a spacer 32 between bricks 20d and 20a or between bricks 20b and 20e.

[0059] Spacer 32 can be constructed of polyvinylchloride, for example, using conventional plastic molding techniques. In one embodiment, spacer 32 is formed into a strip of spacer elements 42. **Figure 7** illustrates spacers 32 in two strips formed from eight (8) spacer elements 42 (four in each of the two strips). The two strips are temporarily joined at the ends with bars 44.

[0060] Each spacer element 42 contains side edges 36 which are angled back from top surface 34. A transverse groove serving as break notch 46 is formed between each adjoining spacer element 42 and between bars 44 and spacer elements 42. Spacer elements 42 have a longitudinal dimension such that an integral number of spacer elements 42 can be used to form common depth dimensions for common modular building components. For example, in a preferred embodiment, each spacer element has a longitudinal dimension of 2¼ inches (5.7 centimeters). This allows two spacer elements 42 to form one spacer 32 having a length of 4½ inches (11.4 centimeters) which is approximately equal to the width (depth) of commonly available standard size of brick 20. Up to four (4) spacer elements 42 can be used together to accommodate a veneer wall 18 thickness of up 9 inches (22.9 centimeters).

[0061] Details of the installation of spacers 32 to form head joint drainage devices are illustrated in **Figures 8** through **15**. As shown in **Figure 8**, a steel lintel 24 is prepared with flashing 28. No mortar 30 is used on top of lintel 24 or flashing 28. Bar 44 is snapped from spacers 32 (**Figure 9**) and one or more spacer elements 42 are separated by hand from the remainder of the spacer strip (if any). The number of spacer elements 42 used corresponds to the depth of the bricks into which the spacer 32 is to be placed. After a brick 20 is placed on lintel 24 (and flashing 28), spacer 32 is placed (**Figure 10**) beside brick 20 with top surface 34 facing up. A side view of spacer 32 so placed is shown in **Figure 11**. Note that spacer 32 has a length which is at least as great as the depth of brick 20. **Figure 12** illustrates two spacers 32 placed between three bricks 20 creating two weep holes 40. A bed of mortar 30 is spread conventionally (**Figure 13**) to the top of bricks 20 and mortar 30 is tuck pointed in head joints between bricks 20 (**Figure 14**). **Figure 15** illustrates the finished wall system 10 in a close-up detail at the head joint at the top left corner of window opening 22. The mortar 30 has been tooled and brushed creating a professionally finished wall veneer 18. Spacers 32 create weep holes 40 allowing moisture in wall system 10 to drain from the wall at the top of the head joint.

[0062] Although various embodiments of the present invention have been described as being constructed from particular materials, e.g., steel, plastic, polyvinylchloride, it is to be recognized and understood that other materials could also be used.

[0063] While the present invention has been described through the use of bricks as modular building products, it is to be recognized and understood that other modular building products could also be used such as concrete blocks or stone, either natural or synthetic.

[0064] While top surface 34 of spacer 32 has been described as being formed as a solid surface, it is to be recognized and understood that other constructions are possible. For example, top surface 34 could be a grid or mesh as long as such top surface 34 substantially prevents mortar 30 from penetrating top surface 34 and clogging weep hole 40.

[0065] Although side edges 36 have been described as being tapered or angled back along each spacer element, it is to be recognized and understood that other configurations are also possible and contemplated. For example, side edges 36 need not be tapered or angled back to achieve the functional result required. Further, both ends of sides edges need not be tapered or angled back, i.e., perhaps side edges 36 may only to tapered or angled back from front edge 38 of top surface. Additionally, it is not necessary that side edges 36 be solid. Side edges could be formed from posts or other structural elements designed to support top surface 34 from lintel 24 / flashing 28 during tuck pointing of mortar 30.

[0066] While various embodiments of the invention have been described as used in conjunction with lintel 24, it is to be recognized and understood that such construction techniques, structures and methods apply equally well to wall systems, head joints and methods of drainage used in conjunction with shelf angles.

[0067] Various modifications and alterations of this invention will be apparent to those skilled in the art without departing from the scope and spirit of this invention. It should be understood that this invention is not limited to the illustrative embodiments set forth above.